

SCIENCE

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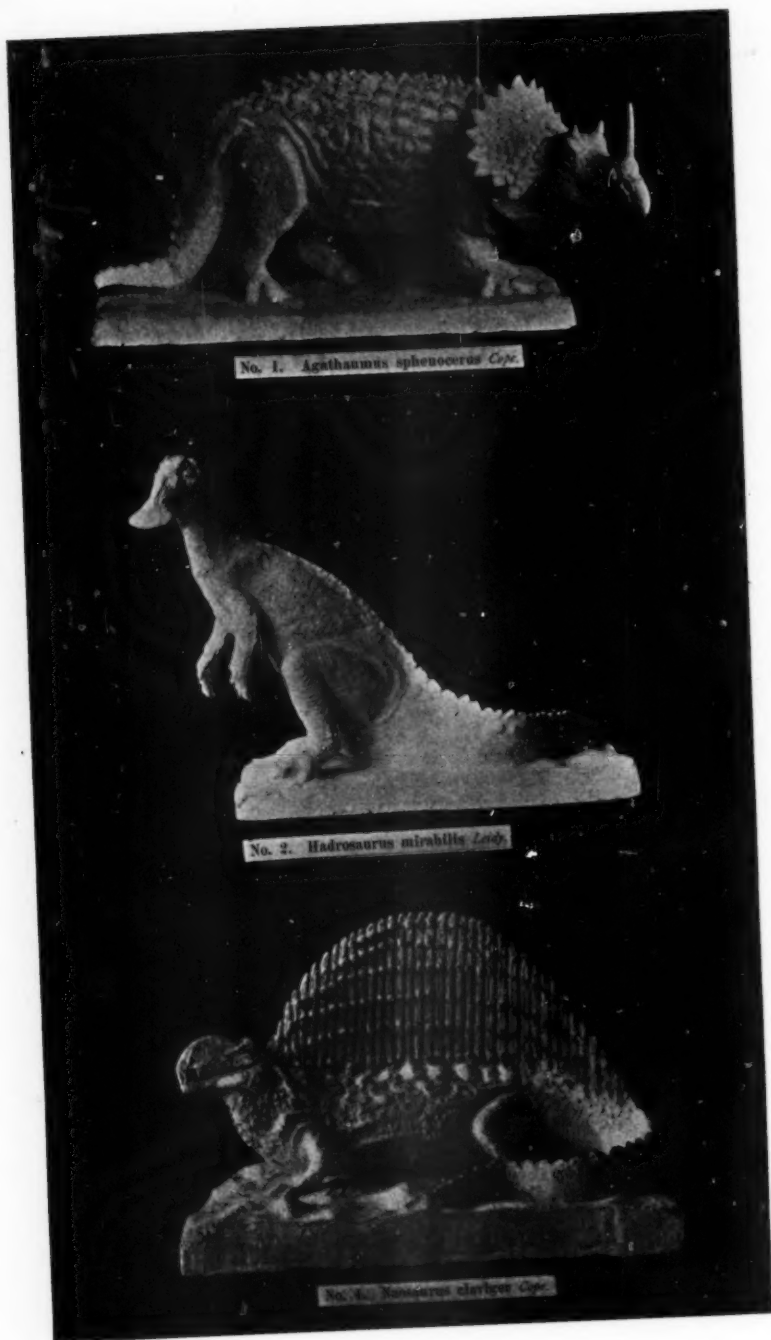
MODELS OF EXTINCT VERTEBRATES.*

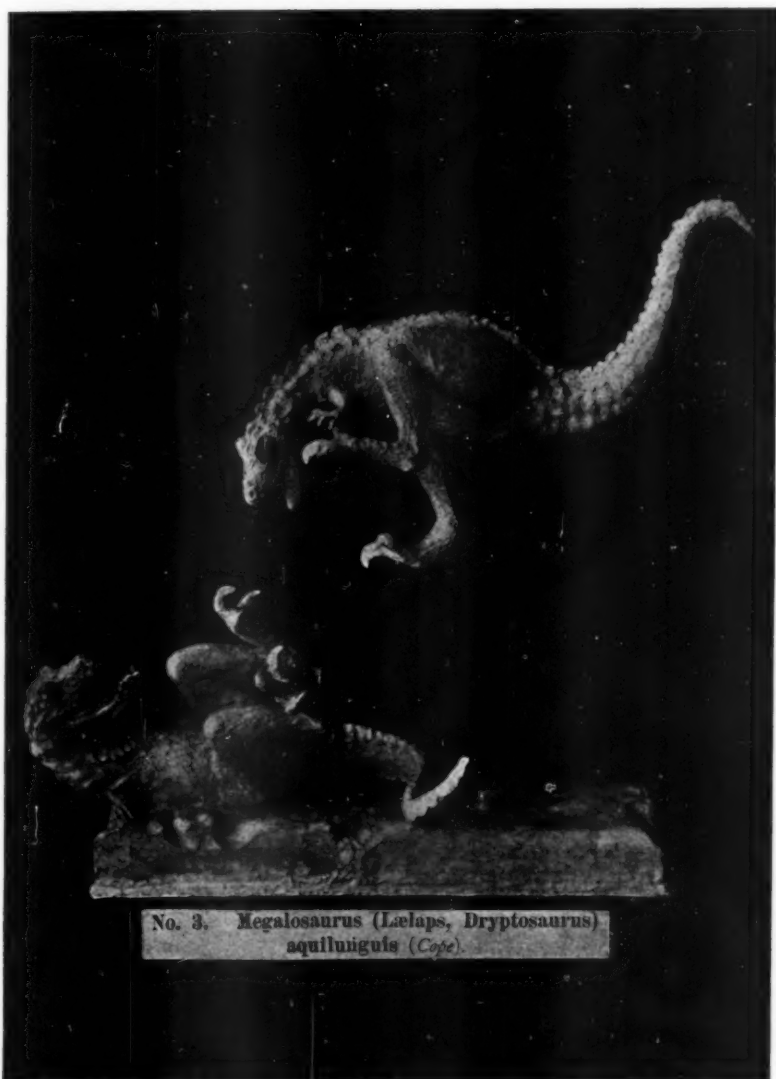
THERE are certain obligations resting upon the curators of metropolitan museums from which curators of university museums should enjoy a grateful immunity. These mainly involve the difficult undertaking of arousing interest and spreading accurate information among a very large class of inquisitive but wholly uninformed people. If these obligations are unfulfilled the metropolitan museum fails in its purpose and deserves the withdrawal of public support.

With this general idea in mind, members of the Department of Vertebrate Paleontology at the American Museum have been making a special study of all the legitimate methods of attracting the attention and interest of visitors. Among these methods are the series of water-color restorations of extinct vertebrates, executed by the animal painter, Mr. Charles Knight, with the aid of various scientific suggestions and criticisms. The preparation of these drawings involves a far more careful preliminary study than would generally be supposed. The artist begins by making a number of models in wax, based upon the actual proportions and muscular indications of the skeleton, and by

*Catalogue of Casts, Models, Photographs and Restorations of Fossil Vertebrates, issued by the Department of Vertebrate Paleontology, American Museum of Natural History, April, 1898.

MRS. intended for publication and books, etc., intended for review should be sent to the responsible editor, Professor J. McKen Cattell, Garrison-on-Hudson, N. Y.





a series of preliminary anatomical studies representing different attitudes and feeding habits. Thus in the restoration of an extinct animal the proportions and positions of all the joints and angles of the feet and limbs may be made true to life. The lips, nos-

trils and gape of the mouth are determined by comparison of the length of the nasals, size of the anterior nares, character and position of the teeth, with similar parts in the most nearly related forms. The eyes are carefully located and proportioned. Up

to this point the animal may be considered a fairly correct representation of the original. On the other hand, the shape of the ears, the color and epidermic characters are largely imaginative, except in so far as they are suggested by relationship to modern allies, as in the case of horses, tapirs, rhinoceroses and other forms.

Out of the necessity of giving the restorations a complete and natural artistic relief, the wax models have been made with increasing care, and it finally occurred to the writer that, with a little more elaboration, the models themselves might be made well worthy of preservation in plaster form, first finished in wax and then cast from a carefully prepared plaster model, as represented in the accompanying photographs.

The frilled Dinosaur, *Agathaumas sphenocerus*, Cope, is based upon a prior restoration, published by Professor O. C. Marsh, of his *Triceratops prorsus*, this genus and species being distinguished from *Triceratops* by the large anterior median horn and the small posterior paired horns. As well known from Professor Marsh's descriptions and restorations, these Dinosaurs were great herbivorous quadrupeds, with fore and hind limbs more symmetrically developed than in any other members of this sub-class, the total length of the skeleton being about 25 feet. In addition to the powerful horns the skull is protected by a great bony collar or frill, which is surrounded by heavily barbed tubercles. The tubercular character also given by Mr. Knight to the epidermis is conjectural.

The form of the second type, *Hadrosaurus mirabilis*, Leidy, is quite as fully known, as it rests upon the remarkably complete skeleton in the Cope collection, found in 1882 by Dr. J. L. Wortman in the Laramie Cretaceous, and described by Professor Cope under the generic name *Diclonius*. This animal was thirty-eight feet in length, with

a long neck, flattened duck-like bill, weak teeth, small fore limbs and heavy hind limbs, the body terminating in an elongated tail. It was probably of littoral habits, feeding on soft water-plants or small mud-loving organisms.

The third type, *Megalosaurus aquilunguis*, Cope (Laelaps), is the most extreme example of a highly conjectural restoration. It embodies the original ideas of Cope upon this subject, that these carnivorous Dinosaurs were capable of leaping through the air. The restoration is based upon the fragmentary skeletons in the Cope collection, and upon Professor Marsh's restoration of the allied form, *Ceratosaurus*. The skeleton was light, partly pneumatic. This species was about seven feet in length of trunk and neck, and had eight feet of tail. The disproportionately long hindlimbs and heavy tail remind one of the Kangaroo, which animal it may have resembled, both in its method of progression by leaps instead of by walking or pacing and in using its powerful hind feet, armed with heavy claws, in attacking its enemies.

A most picturesque form is the *Naosaurus claviger*, Cope, which, although of the most extreme appearance, is probably nearer the truth than any one of the foregoing models. The enormous spines upon the back are not in the least exaggerated, since the spines of *Naosaurus* collected by Dr. E. C. Case for the University of Chicago are even longer than those in the Cope collection. The skull in the Cope and in the University of Chicago collections is also sufficiently perfect to assure us of the substantial fidelity of this region. The limbs and tail are lizard-like. The different species of *Naosaurus* reached from three to ten feet in length. The precise function of the extraordinary, rigid fin on the back is not known. It was humorously suggested by Cope that in *N. claviger*, in which the dorsal spines present a series of cross-bars, the fin may have been

used as a sail; it was quite as probably ornamental as protective. This animal belongs to the primitive reptilian order, Pelycosauria of Cope, but it represented a highly specialized side-branch related to the Rhynchocephalia or Proganosauria, as shown by Baur and Case.

Interest in the above series of four is enhanced by the fact that Professor Cope,

and Elk, so far as proportions of the body and the shape of the head are concerned.

Other models are in preparation, and the series of water-color restorations, which now numbers nineteen, is progressing as fast as the complete skeletons are procured and prepared, serving as a basis for anatomical study.

HENRY F. OSBORN.



FIG. 1.—Powell County Natural Bridge.

shortly before his death, gave Mr. Knight the benefit of many criticisms and ingenious suggestions.

The latest of this model series is taken from the remarkable skeleton of *Cervalea americanus*, in the Princeton Geological Museum. It is upon a larger scale than the preceding, and represents the animal as Scott has described it, namely, intermediate in form between the Moose

NATURAL ARCHES OF KENTUCKY.

ALONG the western margin of the Eastern Coal Field in Kentucky are a number of 'Natural Bridges,' which it seems to me cannot be explained in any of the ways yet suggested. They have not been formed by the falling in of the roofs of underground streams, by wind erosion, or yet again in the manner presented by the contribution on this subject in the May 20th number of

SCIENCE, i. e., by the mechanical action of frost on sandstones exhibiting a tendency to conchoidal fracture.

These natural bridges occur in the strip of very rough country formed by the outcrop of the Basal Coal Measure Conglomerate, where it is underlaid first by shale and then by lower Carboniferous limestone and shaly sandstone. This strip is a part of a deeply multi-dissected plateau, known farther south as the Cumberland Plateau. The tributary streams, deeply buried below the old plateau level, have along the margins of the strip cut down into the underlying shale, limestone and shaly sandstone. They have extended their ramifications up the steep slopes to the base of the Conglomerate, where they have hollowed out their virtual sources in the shale, undermined the Conglomerate cliffs and thus formed vast amphitheaters, or 'rock-houses.' The extent of these is often seemingly out of all proportion to the size of the stream leading away from them. These streams sometimes find continuation above the cliffs as wet-weather streamlets and during the times of their flow plunge over the escarpments in picturesque waterfalls. More commonly, however, there is no gathering ground above. By the recession of sources the watersheds have been reduced to the narrowest ridges, which are often quite inaccessible. In a number of instances two streams in their recession have met in the shales under the Conglomerate. Two 'rock-houses' have met back to back and formed a 'Natural Bridge.' There are three of these bridges in Kentucky that are beginning to have something more than a local celebrity. One of these is in Pulaski, one in Wolfe and one in Powell county. Views of the Powell county bridge accompany this sketch. Perhaps a tendency to conchoidal fracture in the coarse sandstone has favored the hollowing-out process that has resulted in these natural arches, but in the main they

are due to the mechanical action of water causing a recession of sources in the way above indicated.

ARTHUR M. MILLER.

STATE COLLEGE, LEXINGTON, KY.

THE INTERNATIONAL AÉRONAUTICAL CONFERENCE AT STRASSBURG.

THE meeting, ten weeks ago, of the International Aeronautical Committee appointed by the Paris Meteorological Conference of 1896 was noteworthy in two respects. First, it marked the beginning of a new era in meteorological investigation, as shown by an organized effort to cut loose from observatories on the earth and to study the conditions of the free air; and, second, by the assembling at Strassburg of French and Germans, political questions were held to be subservient to the conquest of the high atmosphere and the extension of the common realm of science. Official and private hospitality was abundant and the utmost good fellowship prevailed among the members of the Committee and the other meteorologists, physicists and aeronauts who were present by invitation. It was regretted, although hardly a surprise, that there was no one from Great Britain, where, since Glaisher's remarkable balloon ascension, little has been done to explore the free air. The following named members of the Committee were in attendance: Professor Hergesell, the President, of Strassburg; MM. de Fonvielle, the Secretary, Cailletet and Besançon, of Paris; Drs. Assmann and Berson, of Berlin; Professor Erk, of Munich; General-Major Rykatcheff and Colonel Kowanko, of St. Petersburg; Mr. Rotch, of Boston, United States.

The methods discussed for obtaining observations in the free air were balloons with aeronauts; *ballons-sondes*, or unmanned balloons to carry self-recording instruments to the height of ten miles or more; and,

for observations within a mile or two of the earth, the captive kite-balloon and kites with self-recording instruments. Aside from technical details, the most important decisions concerning balloons related to the measurements of their height and of the air temperature around them. Although, for the determination of height, from observations in the balloon, the mercurial barometer must be considered as the standard, yet its indications are only accurate when the balloon has no vertical velocity. If aneroids are used they should be compared frequently with the standard and, so far as possible, under actual conditions. It was decided that for the calculation of height the barometric observations should be reduced everywhere by the same method, whatever that might be ultimately. M. Cailletet described his apparatus for photographing automatically, at fixed intervals of time, a barometer in the balloon and the ground vertically below, so that the barometric heights can be calculated and from a map the true heights and the route of the balloon may be determined. This apparatus was recommended for use with both manned and unmanned balloons. On account of the rapid changes of temperature, it was recognized that very sensitive thermometers must be employed in *ballons-sondes* and that their artificial ventilation is essential. M. Cailletet exhibited a thermometer having a spiral silver tube for its bulb soldered to a glass tube, both being filled with the liquid toluene. This thermometer is extremely sensitive. M. Teisserenc de Bort showed a very sensitive self-recording thermometer which is at the same time almost insensible to shocks. It is composed of a blade of German silver set in a frame of invariable steel, and can be ventilated in a *ballon-sonde* by a fan turned by a weight attached to a long wire. For the determination of the temperature of the air around manned balloons the

proper instrument to employ is Assmann's aspiration thermometer, hung at least 5 feet outside the basket, but simultaneous comparisons with the sling thermometer were advised. The self-recording instruments carried in manned and unmanned balloons should be verified in pneumatic and refrigerating cabinets under such changes of pressure and temperature as might occur in the atmosphere.

Drs. Hergesell and Berson urged the importance of simultaneous balloon ascents in the different countries when there was a barometric depression over the European continent. From a meteorological standpoint the manned ascents have an importance which the *ballons-sondes* do not possess, because the temperature of the highest atmosphere has no influence on the meteorological elements near the surface of the earth. M. de Fonvielle, however, called attention to the interest which thermometric measurements at a very high altitude would offer for the determination of the temperature of planetary space. These measures might enable us to choose between the kinetic theory of gases, which assumes the temperature of 273° Centigrade below zero, and Fourier's hypothesis that the temperature of space is near that of the minima observed in the polar regions of the earth.

It was agreed that the fifth international ascent of *ballons-sondes* should take place early in June, and manned or unmanned ascents were promised in Austria, Belgium and Italy, in addition to those in Germany, France and Russia, which countries had already cooperated. On the day designated, observations at the mountain stations, as well as with kites and captive balloons, will serve for the simultaneous study of the lower air.

Mr. Rotch read a report, which he had been asked to prepare, on the use of kites for meteorological observations, based on the experiments carried on at Blue Hill Ob-

servatory for several years past. The advantages which kites have over balloons up to a height of at least 10,000 feet, whenever there is wind, were pointed out. It was reported that, besides their use in the United States, kites were being employed to obtain meteorological records at St. Petersburg and near Paris. M. Tacchini proposes to try them on Mounts Cimone and Etna, and Professor Hann hopes to obtain data in this way above the Sonnblick, the highest permanently occupied observatory in Europe. The Conference recommended kites as being of great value to meteorology, and desired that they should be used at the chief observatories, together with the kite-balloon (described hereafter) for continuous observations. The Committee was enlarged by the addition of the following persons: M. Teisserenc de Bort and Prince Roland Bonaparte, of Paris; Professor Hildebrandsson, of Upsala; Professor Pernter and Lieutenant Hinterstoisser, of Vienna; Captain Moedebeck, of Strassburg, and Lieutenant von Siegsfeld, of Berlin. The next meeting will be at Paris in 1900.

During the Conference there were two trials of the kite-balloon—a captive balloon which, unlike the ordinary spherical one, is not driven down or carried away by strong winds. It is the invention of Lieutenants von Parseval and von Siegsfeld, of the German army, where it is used for reconnoitering, but the smaller Strassburg balloon, constructed by Mr. Riedinger, of Augsburg, for Professor Hergesell and Captain Moedebeck, is the first to lift self-recording meteorological instruments. It consists essentially of a cylinder of varnished linen, having a volume of 7,770 cubic feet, so attached to the cable that its upper end is inclined towards the wind, which thus tends to raise the balloon. The cylindrical form is preserved, notwithstanding leakage of gas, by admitting wind into an auxiliary envelope at the rear end, which also serves

as a rudder, stability about the axis being secured by lateral wings. The instruments are contained in a basket, with open ends, hung far below the balloon. The azimuth, angular altitude and traction of the cable are recorded continuously by an ingenious dynamometer. In spite of unfavorable weather and gas of insufficient lifting power, the experiments were fairly successful, and previously the balloon had been maintained during several days above the city.

The Committee also witnessed an ascent of the *ballon-sonde* 'Langenburg,' carrying self-recording instruments. This silk balloon, when inflated with 14,000 cubic feet of coal gas, had an initial lifting force of 440 pounds in excess of its load. Owing to a premature start, the ballast was left behind, and the sudden plunge upward not only emptied some of the gas, but stopped the clock movements of the thermographs. The ascent was made in the late afternoon, and the balloon, which soon disappeared in the clouds, was found the next day about sixty miles southeast of Strassburg, having risen more than six miles, as was determined from its barometric record.

A. LAWRENCE ROTCH.

THE FIELD COLUMBIAN MUSEUM.

THE Field Columbian Museum is making fast progress and doing effective work in the various departments. The Zoological Department is busy with the rich collection brought back by Professor Elliot's expedition to Somaliland. Two notable groups have been installed in the West Court, viz.: the lesser koodoo (*Strepsiceros imberbis*) and Waller's gazelle (*Lithocranius walleri*). The first is said to be the largest and most complete of its kind in the world, and in fact the only one in existence giving a full representation of this beautiful spe-

cies. It consists of an old and a young bull, an old and a young cow and two young of different ages. The most striking accessory is an ant hill upon which is perched an African owl. The representatives of the scant plant life are faithfully executed, and, although the area is limited, the impressions of the desert are forcibly conveyed to the spectator.

The same is true of the second group, consisting of two males, two cows and two young. With its long neck, large eyes and slender body, this gazelle, the *cerenuk* of the natives, is graceful in form, if not in movement.

A third group, now almost ready, will represent the *Oryx* antelope (*Oryx beisa*) and consist of a family of five. This species will be in marked contrast to the others, on account of its rather clumsy form, that is offset, however, by its remarkably long, straight, dangerous horns, carried by both sexes. The center will be occupied by another of those ant hills which constitute so conspicuous a feature of the landscape in many parts of Africa. It is generally built around a tree, completely enclosing the trunk and nearly all the branches. After the ants have eaten the tree the hill is abandoned to be blown down by the winds. Some of them reach a height of forty feet. Together with the imposing musk-ox group, the two already finished have been attracting an ever increasing attention from visitors, who are outspoken in their admiration of the artistic skill displayed by the taxidermist, even if they fail to appreciate their scientific value.

The ultimate idea is to give most of this wing up to African collections, some sixteen groups in all having been planned, headed by a family group of polar bears, towards the center and rounded up in the rear by the musk-ox group, now in front. The final value of these and other groups as a means of creating interest in scientific re-

search in this busy metropolis of the West can hardly be overrated.

The Anthropological Department has undergone thorough rearrangements of late, the idea being to give more prominence to the geographical distribution of the human races. Dr. Dorsey, the acting Curator, in December last, undertook a second trip to the Pueblo of Oraibi, accompanied by the sculptor Mr. F. B. Melville, for the purpose of securing plaster casts from life of Moki Indians, as well as completing the ethnological collections secured on a former trip.

The first results of this very successful expedition will soon be accessible to the public in the shape of two groups representing a Moki maiden grinding corn and a woman baking 'piki,' or paper bread. These are both to be shown in the interior of a Moki house, every surrounding detail of which will be as genuine in the reproduction as in the original. Material is on hand for another group representing a woman making pottery and a child reposing in a cradle board; for two weavers at work in their 'kivi,' or underground apartment, and for a splendid boomerang thrower. The most picturesque group, however, will probably be a Moki bride arrayed in all the splendor of her marriage finery; as also two representations of the 'katsina,' or masked dancers.

Ultimately the still more difficult task of giving some representation of the famous snake dance may be undertaken, but not until another visit to Oraibi shall have been made. On the whole, it can be confidently predicted that the Moki hall in the Field Columbian Museum, when completed, will bid fair to be unique in its kind, and will certainly prove a formidable rival in popular interest to the animal groups in the Zoological Department and the monographic representations of the forest trees of North America, fairly started in the Botanical Department.

Professor Farrington, Curator of the Geological Department, accompanied by Mr. E. S. Riggs, of Princeton University, is conducting an expedition in the Bad Lands of South Dakota for the purpose of collecting vertebrates from the White River beds. Gratifying success has attended the work of the expedition thus far. There have been secured one nearly complete small *Titanotherium* skeleton, four well preserved skulls and many miscellaneous bones of other individuals of the same genus. *Crocodylus* and *Aceratherium* remains have been found in the same beds. The party will later seek to secure specimens of *Dæmonelix* from northwestern Nebraska and close the season with a visit to some newly discovered *Equus* beds in Montana.

President Ayer has just returned from his annual trip to Europe and Africa, and has brought back an even richer harvest for the Museum than on former occasions. Among the most interesting may be mentioned a sitting mummy of great antiquity and in a splendid state of preservation, several figure heads and busts carved in stone, and a collection of Egyptian and Etruscan jewelry. In Rome he secured two very curious incinerating tomb boxes, made from tufa in the general shape of temples, the largest being six feet long, three feet wide and two feet high, both highly decorated in archaic drawings of griffins, dogs, geese, lotus flowers and scrolls. They are thought to be of Etruscan origin and date back to from 700 to 900 B. C. The new accession will certainly prove a valuable addition to the already very respectable collections representing Italian and Egyptian archaeology.

CURRENT NOTES ON PHYSIOGRAPHY.

YUKON GOLD DISTRICT.

A REPORT on the Alaskan expedition of Messrs. Spurr, Goodrich and Shrader in the summer of 1896, written chiefly by Spurr, is

lately published (18th Ann. Rept. U. S. G. S., 101-392). The most important physiographic contributions are in Chapter IV., by Spurr and Goodrich, in which crustal movements are inferred from the topographic forms and drainage features. Extensive pre-Neocene denudation wore down the older rocks to gentle slopes, between which the rivers meandered in broad and shallow valleys. Now elevated, this denuded region forms the 'Interior Plateau,' which, when seen from an elevated point, appears like a gently undulating plain, above which hills and mountains rise to moderate height, and beneath which the deep valleys are incised. The region about Forty-mile creek exhibits these features with remarkable distinctness; the steep-sided valley, several hundred feet deep, curves about as if incised from a meandering stream on the former valley floor; the sharp turns of the stream being known to the prospectors by the suggestive name of 'kinks.' The elevation by which the present cycle of denudation was introduced is thought to have taken the form of broad, flat folds, accelerating some streams and retarding others.

Additional information on Alaska is found in a 'Map of Alaska,' with text prepared under the direction of S. F. Emmons, published by the U. S. Geological Survey; and in Bulletin No. 16, Department of Labor, chiefly occupied with an account of a tour in Alaska by S. C. Dunham.

PHYSICAL GEOGRAPHY OF WORCESTER, MASS.

THE Physical Geography of Worcester, Massachusetts, by J. H. Perry, with illustrations by J. C. Lyford (published by the Worcester Natural History Society, 1898), is one of a class of essays that are rarer than they should be in the best interests of home study. Here we find a good explanatory account of the dissected uplands of southern New England and their glacial

ornamentation with drumlins and gravel beds, such as must greatly aid the field work of any enterprising teacher who leads her classes in geography out of doors. The practical difficulty that the teacher of to-day will find in using such a guide as this essay will arise, first, from a want of a sufficiently comprehensive scheme of geographical study, by which the facts of local observation shall be correlated with geographical facts generally; and second, from the absence of a series of comparative examples, by which local features may be used to illustrate the various parts of the world which they resemble.

JAMAICA.

SPENCER continues his Antillean studies in an article on Jamaica (*Late Formations and Great Changes of Land in Jamaica*, *Canadian Journal*, V., 1898, 324-357), from which the following notes are taken: The White-limestone uplands, deeply dissected, abound in caverns and are in part uninhabitable from the numerous sinks, or 'cock-pits,' 200-300 feet in diameter and 'deeper than they are wide.' The border of the uplands is dissected by torrential wash-outs, which enter broad-floored valleys 'almost reduced to the base level of erosion.' The northern coast is comparatively abrupt in its descent into the sea; this "suggests great dislocations off that part of Jamaica, and that the forces which squeezed up the island also rammed down the sea floor to the north." On the south coast broad valleys floors independent of structure form embayments sloping to the shore line from among highland spurs. The lower portions of certain streams have cut canyons beneath former broad valleys floors, indicating recent uplift; several examples of this kind being shown on the northern coast.

CUBA.

A 'TIMELY' article on Cuba from the competent pen of R. T. Hill is the leading

article in the 'Cuba number' of the *National Geographic Magazine* (IX., 1898, 193-242). Besides a brief summary of physiographic features, it gives a good general account of population and industries, in which the physiographic control is well brought forward. A contour map, compiled from the best known authorities, is a valuable contribution to the geography of the island.

APPALACHIA.

THE latest number of *Appalachia*, March, 1898, includes a number of good illustrations of the Canadian Rocky Mountains from photographs, some of which are from the great series taken by the Dominion Topographical Survey. The usual mountain-climber's narratives are by Thompson and Habel. The region is of strong Alpine scenery—grand snow fields aloft; great glaciers descending into the upper valleys; old moraines of huge size farther down; avalanche paths on steep slopes beneath high cliffs; lakes curiously related to the larger valleys. Although as yet not productive of many physiographic essays, there is no part of his continent that offers so good and so accessible a field for the careful study of Alpine forms.

W. M. DAVIS.

CURRENT NOTES ON ANTHROPOLOGY.

THE RATIO OF HUMAN PROGRESS.

At the last meeting of the British Association, Mr. George Hies read a suggestive paper, 'Why human progress is by leaps.' He points out that the triumphs of man over nature in the discovery of its laws of action are not simple additions to his resources, but are multipliers of high potency, often extending over the whole field of his activity. This he illustrates by the manifold applications of electricity in our own day, and by the use of fire in prehistoric times. He draws the conclusion that man's

advance will in the future be at a continually accelerated pace.

This reasoning is closely akin to that of Lewis H. Morgan in the chapter on the rate of human progress in his 'Ancient Society' (New York, 1878). He there argues that culture-progress proceeds by geometrical, not arithmetical ratios; which is substantially Mr. Iles' position.

It should be borne in mind, however, that true culture cannot be measured by criteria drawn solely from the utilitarian arts. Civilization has been nicely defined by a French writer as a 'state of mind,' rather than a schedule of possessions; and this is signally true.

THE ITALIAN ANTHROPOLOGICAL INSTITUTE.

UNDER the title 'Istituto Antropologico Italiano,' Dr. Giuseppe Marina has opened at Leghorn an establishment which has for its aim the popularizing of anthropologic work, and also the collection of material for scientific purposes. It embraces psychological, antropometrical, pathological and ethnographic investigations. Persons can apply and for a moderate fee have themselves examined by the most approved modern methods in all these directions. A careful record is kept, and the same individual may return from time to time to have the examination repeated—a procedure in which he has a personal interest, while the comparative results thus obtained will prove of value to science. In addition to this feature, lectures, publications, open discussions and other plans for attracting and educating the public in anthropologic matters will be cultivated. The history of culture, demography, sociology and hygiene will be brought forward with especial prominence.

Dr. Marina deserves great credit for this excellent and original scheme of bringing home to the general public the practical value of anthropology. A descriptive cir-

cular may be obtained by addressing him (Livorno, Italy).

'ORGANIC' SOCIOLOGY.

THERE was a time when it was quite useful to speak of language as an 'organism' and human society as an 'organism.' The word brought the inter-relation of parts clearly to the mind. That there was any actual identity, either of parts or of functions, or of laws of growth, with anatomical organisms was not intended. Of late, however, a class of writers have insisted on such identity, and have carried it out in quite ridiculous parallels, such as that the railroads are arteries, the frontiers are the epidermis, etc. (Lilienfeld, Worms).

Nothing is gained by these similes, which are, in fact, empty literary formulas; and it is gratifying to see that such solid writers as Lester F. Ward, in this country, in the *Journal of Sociology*, and Dr. S. R. Steinmetz, in the *Zeitschrift für Socialwissenschaft*, have condemned them as unscientific, and barren of profitable results. As much may be said of the term 'super-organism,' proposed by Mr. Herbert Spencer, though that writer defines it in such a manner as to divest it of most of its erroneous suggestiveness. Professor Giddings adopts 'physio-psychic organism' as the correct term for the social group; but this is just as applicable to the living individual, and, applied to a society, may be as misleading.

D. G. BRINTON.

UNIVERSITY OF PENNSYLVANIA.

NOTES ON INORGANIC CHEMISTRY.

FULLER particulars regarding the liquefaction of hydrogen and helium by Professor Dewar have come to hand in his paper in the *Proceedings* of the Chemical Society. As early as 1895 Dewar had constructed an apparatus by which he could produce a jet of hydrogen containing liquid. It was then shown that such a jet could be used to cool substances below the temperature which

could be reached by the use of liquid air. A much larger apparatus of the same type was then constructed, in which the liquid air plant was combined in its circuits and arrangements for the liquefaction of hydrogen. The construction of this apparatus consumed a year, and many months were occupied in preliminary trials and tests. On May 10th hydrogen was liquefied by allowing the gas, cooled to -205° , and under a pressure of 180 atmospheres, to escape continuously, at the rate of ten to fifteen cubic feet per minute, from the nozzle of a coil of pipe in a double silvered vacuum vessel of special construction, surrounded by a space kept below -200° . Liquid hydrogen commenced to drop from this vacuum vessel into another doubly isolated by being surrounded by a third. 20 cc. liquid hydrogen were obtained before the hydrogen jet froze up from the solidification of the air in the pipes. Liquid hydrogen is clear and colorless, showing no absorption spectrum, and the meniscus is as well defined as in the case of liquid air. It has a relatively high refractive index and dispersion, and its density appears to be in excess of the theoretical value 0.18 to 0.12, deduced from its atomic volume in organic compounds, and the limiting density found by Amagat for hydrogen gas under infinite compression. Dewar's experiments have given a density of 0.62 for hydrogen condensed by palladium, and this may not be far from the value for the liquid. No arrangements were at hand to determine the boiling point of hydrogen, but it must be excessively low, for a long piece of glass tubing sealed at the lower end and cooled by immersion in liquid hydrogen immediately filled with solid air where it was cooled. A tube of helium from the Bath gas was placed in liquid hydrogen, and a distinct liquid was seen to condense, thus showing that there cannot be any great difference in the boiling points of hydrogen and helium. All known gases have now

been condensed to liquids which can be manipulated at their boiling points under atmospheric pressure in suitably arranged vacuum vessels. With hydrogen as a cooling agent, it will be possible to get within 20° or 30° degrees of the absolute zero, and its use will open up an entirely new field of scientific inquiry.

In seconding a vote of thanks to Professor Dewar, moved by Sir William Crookes, Dr. Armstrong called attention to the fact that in the earlier days of the Chemical Society much attention had been given to the discussion of the properties of hydrogen, and the view that it possessed metallic properties had been strongly advocated. This was strongly supported by Graham's investigations of hydrogenized palladium, or, hydrogenium, as Graham called it, condensed on palladium. Dr. Armstrong ventured to think, however, that the subject had been too much regarded from the inorganic side, and that when the evidence to be derived from organic chemistry is taken into account it is more probable that hydrogen will be found to resemble the petroleum hydrocarbons rather than the metals. In reply to a query from Dr. Armstrong, Professor Dewar said that, since argon solidifies when cooled in liquid air, his experiment with helium shows that the gas (helium) from the Bath well does not contain argon, and, unless possibly hydrogen is present in small quantity, the helium from the well was pure.

ACCORDING to chemical literature the dark precipitate obtained by reducing bismuth solution with alkaline stannous chlorid is the monoxid, BiO . This oxid is also supposedly obtained in the fusion of the metal. L. Vanino and F. Treubert, of Munich, publish in the *Berichte* an investigation of this compound, and show that in the former case the precipitate is metallic bismuth and in the latter the compound is a mixture of the metal with the ordinary oxid

Bi_2O_3 . This study shows the importance of repeating much of the work of earlier chemists. With the superior methods of manipulation and increased knowledge of to-day, much of the superstructure of the theory of inorganic chemistry rests upon a very insecure foundation of facts. In view of the decreasing affinity in the elements of the fifth group with increase of atomic weight, the existence of the oxid BiO is theoretically very probable, but that it really exists has not been shown experimentally. The same authors show that in an alkaline lead solution stannous chlorid precipitates all the lead as metallic lead.

J. L. H.

SCIENTIFIC NOTES AND NEWS.

THE ROYAL GEOGRAPHICAL SOCIETY.

THE annual meeting of the Royal Geographical Society was held in London on May 23d, Sir Clements Markham in the chair, and the annual dinner of the Society took place in the evening. At the annual meeting the medals of the Society were presented to Lieutenant Peary, Dr. Sven Hedin and others in accordance with the award that we have already announced. The President then delivered his annual address, in the course of which he said, according to the report in the *London Times*, that a very sympathetic reply had been received from the Prime Minister's private secretary to the appeal on behalf of a government Antarctic expedition. A meeting of very great interest was held in the beginning of the year by the Royal Society, in which eminent authorities were unanimous in insisting on the necessity of renewing Antarctic exploration, and on the duty of the British government to take a substantial share in it. A German expedition was being organized on a liberal scale, and funds were being collected throughout Germany for the purpose. Moreover there was reason to hope that the Norwegian government might send out an expedition also, perhaps under the leadership of Dr. Nansen, to carry out exploration mainly on land. Meanwhile the Belgian expedition, under M. de Gerlache, had been actively

engaged, and the expedition, liberally supported by Sir George Newnes, under M. Borchgrevink, was in an advanced state of preparation. After a brief reference to Mr. Jackson's account of the Jackson-Harmsworth expedition, to Lieutenant Peary's labors and to those of Captain Sverdrup, Colonel Fielden, Mr. Pearson, Mr. Arnold Pike and Sir Martin Conway, the President said that German and Swedish expeditions were in progress for Spitzbergen and Franz Josef Land. Germany was setting an admirable example in scientific exploration. Besides the Antarctic expedition referred to, the German government had made a grant of £15,000 for oceanic research, especially in the Atlantic and Indian oceans. In the North Atlantic much good work was done under the joint cooperation of the Swedish, Norwegian, German and British governments. He hoped that during the coming summer authentic and satisfactory information concerning the hazardous balloon expedition undertaken by M. Andr  e might be received. After reference to the other papers and the results of other expeditions during the past year and to the most important publications of the year, the President briefly dealt with the subject of education.

He said that both at Oxford and Cambridge geography continued to improve its position. At Oxford the University bore the entire expense of the readership. After long and careful consideration, the Council decided to continue the Society's contribution to the Cambridge lectureship, on the understanding that the University would take it over at the end of five years, and that the lectureship would be elevated to a readership. The reader, Mr. Yule Oldham, sent a satisfactory report of the work during the past year. With regard to Oxford, Mr. Mackinder had given the Society an account of his labors both at Oxford and at Gresham College. The measures adopted by the Council last year for increasing the efficiency and extending the scope of the system of instruction conducted by Mr. Coles had quite fulfilled expectations. Last year (1896-97) 41 intending travellers received instruction from Mr. Coles, one of whom was granted the Society's diploma. In the present year (1897-98) 65 intending travellers had received instruction, an

increase of 24, and five of these had passed before the Committee and received diplomas, one of them being a lieutenant in the navy. Among the pupils there were 26 civilians, 24 officers of the army and navy, four in the colonial service, four civil engineers and two missionaries. The Society owes much to Mr. Coles for the pains and trouble he had taken, and for the time he had devoted to the work of teaching. This year the Society had reached and passed the four thousandth figure in the number of its Fellows. This was a landmark in their progress, while the most notable events in their history this year were the grant of diplomas and the creation of a growing number of trained scientific explorers.

LIQUID HYDROGEN.

AT the meeting of the London Chemical Society on June 2d Professor Dewar gave a short account of the first attempts made to determine the physical constants of liquid hydrogen. Among the most interesting points brought forward, according to the report in the *London Times*, was that just as in the middle of the last century chemists were startled by Cavendish's discovery of a facititious gas, namely, hydrogen, having a density one-fourteenth that of air, so now they were startled by finding in liquid hydrogen a liquid having a density of 0.07, or roughly one-fourteenth that of water. Hydrogen occluded in palladium has been found to have a density of 0.82. Whatever, therefore, be the form in which it exists in that metal it is more than eight times denser than in the liquid condition, and consequently must be in a state of chemical combination, and not merely in one of liquefaction. Liquid hydrogen is thus by far the most extraordinary liquid known. The lightest liquid hitherto obtained is liquid marsh-gas, which has at its boiling-point a density of about two-fifths that of water. Liquid hydrogen, therefore, has only one-sixth of the density of liquid marsh-gas, and the surprising thing is that having such a small density it is so well defined, so easily seen, and so capable of collection and manipulation in vacuum vessels.

Professor Dewar has determined the boiling-point of the liquid by means of a platinum resist-

ance thermometer—practically the only form available at such low temperatures. The result he has obtained is -238° C. at atmospheric pressure; in other words, liquid hydrogen boils steadily at 35° above the zero of absolute temperature. From all analogy it is inferred that the lowering of temperature that will be produced by forcing the liquid to boil *in vacuo* cannot amount to more than 10 or 15° . It is, therefore, possible to say with confidence that at the present moment science can project no method that will get nearer to the absolute zero than 20 or 25° .

The boiling-point of liquid hydrogen is really higher than suggested by theory and the work of other experimenters. The density of the vapor coming off from the boiling liquid is eight times denser than the gas at ordinary temperatures, whereas in the case of liquid air the vapor is only four times heavier. Liquid hydrogen again is 100 times denser than the vapor it is giving off, whereas the density of liquid oxygen is 255 times greater than that of its vapor. The atomic volume of liquid hydrogen at its boiling point is 14.3, while that of oxygen is 13.7.

It may be mentioned that the platinum resistance thermometer when immersed in the liquid hydrogen is cooled to within six platinum degrees of its zero point, so that if cooled these few degrees more—as it can be by means of the liquid boiling under reduced pressure—it must break down, becoming an infinite conductor with no resistance.

GENERAL.

BOSTON UNIVERSITY has conferred the degree of LL.D. on Alpheus Hyatt, professor of zoology and paleontology in the University.

PROFESSOR W. M. DAVIS and Professor E. L. Mark will take advantage of the sabbatical year allowed by Harvard University to spend the period in study and research abroad, while Professor W. G. Farlow will spend the winter in the West Indies. Professor H. F. Osborn, of Columbia University, is also enjoying a sabbatical year and is at present abroad.

THE Loubat prizes of Columbia University, awarded every fifth year, alternately for works on the history, geography and numismatics of

North America, and on the archæology, ethnology and philology of North America, were this year given in the latter group. The first prize of \$1,000 was awarded to Mr. W. H. Holmes, of the United States National Museum, and the second prize of \$400 to Dr. Franz Boas, of the American Museum of Natural History and of Columbia University. We hope to publish later the detailed report of the committee, which consisted of Professor H. T. Peck, Professor D. G. Brinton and Dr. W. J. McGee.

PROFESSOR JACOB REIGHARD, of the University of Michigan, will, during the present summer, make, under the auspices of the United States Fish Commission, a biological examination of Lake Erie. His party will include Professor H. B. Ward, of the University of Nebraska; Mr. A. J. Pieters, and others. During the month of July the party will be engaged in a laboratory established in the United States Fish Hatchery at Put-in-Bay Island, O. In August the work will be continued in a steamer chartered for that purpose.

PROFESSOR KREUTZ telegraphs that Encke's periodical comet has been observed at Mr. John Tebbutt's Observatory, Windsor, N. S. W. Professor Keeler announces the discovery, photographically, on June 11th, of a bright comet, by Mr. E. F. Coddington, of the Lick Observatory.

PROFESSOR RAMSAY has discovered another gaseous element in the air and called it krypton. It was first announced by M. Berthelot at a meeting of the Paris Academy of Sciences on June 6th, and was exhibited at the *conversazione* of the Royal Society on the 8th. The new gas is closely related to helium, and exists in common air in the proportion of about one to twenty thousand. We hope to give further details when the scientific publication of the discovery has been made.

PROFESSOR NERNST, of the University of Göttingen, has recently devised a new form of electric lamp that promises to be of the very highest importance. It differs from the ordinary lamp in that it has a filament composed of magnesia mixed with rare earths, instead of the ordinary filament in a vacuum. The vacuum is not necessary in the new lamp. The filament of

Nernst's lamp is non-conducting when cold, but on being warmed it conducts, and then glows with a very brilliant light. The advantages are that it suffers no decomposition in the air and requires very much less current (about one-third) than the old electric lamp. The problem at present seems to be to find a convenient method for warming the filament, as that cannot be done directly by the current.

MAJOR GIBBON left England on May 26th, with seven other members of his party, for South Africa, with a view of traversing the continent from the Cape to Cairo. He expects to make a journey of about 12,000 miles in eighteen months. The party has the support of the Royal Geographical Society and of the government.

NEWS has been received from M. de Behagle, the African explorer, in which he was on March 2d about to ascend to Mobai to meet M. Liotard, Governor of Upper Ubangi, who had accompanied the Marchand mission and was descending to Brazzaville. On his return to Wadda he intended to go north in the direction of Lake Chad.

PROFESSOR WARREN K. MOOREHEAD, of Columbus, O., has returned from a trip to southern Arizona, where he has made valuable archæological discoveries in the Slado Valley.

A MEETING of the general committee to make arrangements for the Bristol meeting of the British Association was held on June 6th. It was reported that the sum of nearly \$20,000 had been collected locally for the reception of visitors. It is expected that there will be about 2,000 members present.

THE second of the *conversazioni* of the Royal Society, to which, as usual, ladies were invited, was held on June 8th. The most remarkable exhibit was Professor Ramsay's new gas krypton, the spectrum of which was shown along side of those of sodium and helium. Though part of the exhibits were similar to those shown at the *soirée* a month or so ago, there were several new exhibits of interest.

THE British Institution of Civil Engineers held its annual *conversazione* at its rooms in London on May 26th. There were many ex-

hibits of scientific and technical interest, and various demonstrations were given during the evening.

THE annual Congress of the Institute of Public Health of Great Britain will be opened at Dublin on August 18th, under the presidency of Sir Charles Cameron. A health exhibition will be held in connection with the Congress, which will include, in addition to sanitary appliances, bicycles and tricycles and motor cars.

THE sixty-sixth annual meeting of the British Medical Association will be held at Edinburgh, on Tuesday, Wednesday, Thursday and Friday, July 26, 27, 28, 29, 1898. The President is T. G. Roddick, M.D., professor of surgery in McGill University, Montreal, and the President-elect, Sir Thomas Grainger Stewart, M.D., LL.D., F.R.S.E., professor of practice of medicine and clinical medicine in the University of Edinburgh. The address in medicine will be delivered by Thomas Richard Fraser, F.R.S., professor of materia medica and clinical medicine in the University of Edinburgh; the address in surgery by Thomas Annandale, Regius professor of clinical surgery, University of Edinburgh, and the address in psychological medicine by Sir John Batty Tuke, lecturer on insanity, School of Medicine of the Royal Colleges, Edinburgh. The scientific business of the meeting will be conducted in sixteen sections.

THE triennial meeting of the German meteorological Society was held this year during the week after Easter at Frankfort-on-the-Main. In the absence of the President, Professor Dr. Neumayer, Director of the Deutsche Seewarte, presided. He reviewed the progress of meteorology during the past twenty-five years and concluded that Antarctic exploration affords a profitable field for meteorological and magnetic investigations. Among the dozen papers presented one of the most interesting was a study of the amount of sunshine in North America as compared with that in Europe, by Professor Dr. van Bebber. Two honorary members were chosen: Dr. Rykatcheff, Director of the Central Physical Observatory at St. Petersburg, and Professor Dr. Neumayer, who now retires from the direction of the Society,

which he assisted to form in 1883. Eight corresponding members were elected: Messrs. Paulsen, of Copenhagen; Snellen, of Utrecht; von Konkoly, of Buda-Pest; Hepites, of Bucharest; Pernter, of Vienna; Lancaster, of Brussels; Sapper, of Guatemala, and Retch, of Boston, U. S. A.

At the coming convocation of the University of the State of New York the leading chiefs and sachems of the Iroquois, representing the Five Nations, will be present on Wednesday, June 29th, at a formal commemoration and ratification of the election of the University as the permanent wampum keeper of the Iroquois League, and of the deposits in the fire-proof State Capitol of these most precious relics of the famous Five Nations. Brief speeches will be made by representatives of the different tribes, and some of those most familiar with the history and traditions of the Indians say that the event will be, probably, the last general gathering of the Five Nations, and will, therefore, be specially significant.

LORD LISTER, President of the Royal Society, has consented to perform the opening ceremony of the new laboratories of physiology and pathology erected and equipped at University College, Liverpool, by the Rev. S. A. Thompson-Yates, at a cost exceeding £25,000. The opening is fixed for October 8th, when Victoria University will confer on Lord Lister the honorary degree of Doctor of Science.

FREDERICK C. SAYLES, first Mayor of Pawtucket, R. I., has offered to present the city with a free public library in memory of his wife, Deborah Cook Sayles, and has purchased for \$22,500 a site for the same on Summer street.

WOMEN physicians will hereafter be eligible to all official positions in Russia. They will receive the same salaries and pensions as men.

THE Audubon Society of Illinois has secured the conviction of a dealer in Chicago who had in his possession native song birds. It was claimed that the birds were taken in Mexico and elsewhere, but the conviction was obtained in spite of the fact that the place of capture could not be proved.

RECENT issues of the London *Times* announce the deaths of three English men of science, and

give obituary notices, from which we copy. Mr. Osbert Salvin, the eminent ornithologist, died on June 1st at his residence, Hawksfold, near Haslemere. The son of the late Mr. Anthony Salvin, the well-known architect, he was born in 1835, and received his education at Westminster and Trinity Hall, Cambridge, where he graduated as a Senior Optime in the Mathematical Tripos of 1857. Immediately after taking his degree he, together with Mr. W. H. Hudleston (then Simpson), joined Mr. (now Canon) Tristram in his natural history exploration of Tunis and eastern Algeria, where they passed five months. In the autumn of the same year Mr. Salvin proceeded to Guatemala, where, chiefly in company with the late Mr. G. U. Skinner, the celebrated collector of orchids, he stayed till the middle of 1858, returning to Central America (henceforth always to be associated with his name) about twelve months later. He again went out in 1861, accompanied by Mr. Frederick Godman, and continued the explorations he had already begun, but was home again in 1863. In 1865 he married Caroline, the daughter of Mr. W. W. Maitland, of Loughton, in Essex, and with her subsequently undertook another voyage to Central America. In 1874, on the foundation of the Strickland Curatorship in the University of Cambridge, he accepted that office, which he filled until 1883, when, on his father's death, he succeeded to the property at Hawksfold, and moved thither, though there was hardly a week in which he did not pass some days in London, for, with Mr. Godman, he had conceived the idea of bringing out a 'Biologia Centrali-Americana,' being a complete natural history of the countries lying between Mexico and the Isthmus of Panama. This gigantic task, by far the greatest work of the kind ever attempted, taxed all their united efforts, and those of the many contributors they enlisted, and is still in progress. Before beginning this, Mr. Salvin had edited the third series of 'The Ibis,' of which he was one of the founders, and had brought out a 'Catalogue of the Strickland Collection' in the Cambridge Museum. He contributed also the *Trochilidae* (humming birds) and *Procellariidae* (petrels)—on which last group he was the acknowledged

authority, to the British Museum 'Catalogue of Birds,' and almost his latest labor was that of completing and arranging the late Lord Lilford's 'Coloured Figures of British Birds,' while the Royal Society's 'Catalogue of Scientific Papers' enumerates 47 published by Mr. Salvin alone, 23 by him and Mr. Godman jointly, and 54 by him and Mr. Slater, all before 1884. Mr. Salvin was a Fellow of the Royal, the Linnean, the Zoological and the Entomological Societies, on the Councils of all of which he frequently served.

THE death occurred on June 6th at Cambridge, in his 81st year, of the Rev. Percival Frost, F.R.S., D.Sc. Born at Hull, while his father practiced as a solicitor, he was educated at Beverley, Oakham and Cambridge, where he was second wrangler and first Smith's prizeman in 1839, Fellow of St. John's College from that year to 1841, mathematical lecturer at Jesus College from 1847 to 1859, mathematical lecturer at King's College, Cambridge, from 1859 to 1889. He had been a Fellow of King's College since 1882, in which year he was also elected a Fellow of the Royal Society. Dr. Frost was the author of treatises on 'Curve Tracing,' 'Solid Geometry,' 'The First Three Sections of Newton's Principles,' as also of numerous papers published in the *Cambridge Mathematical Journal*, the *Oxford and Cambridge Journal of Mathematics*, and the *Quarterly Journal of Mathematics*.

MR. HENRY PERIGAL, the Treasurer of the Royal Meteorological Society, died on June 7th at the advanced age of 97 years. Mr. Perigal was for some time a clerk in the Privy Council Office, and afterwards in the old Victualling Office. Subsequently he joined the firm of Messrs. Henry Tudor & Son, of Threadneedle street. He was the author of various works on astronomy, bicycloidal and other curves, kinematics and the laws of motion, probable mode of constructing the pyramids, etc. He was a Fellow of the Royal Astronomical, Royal Microscopical and Royal Meteorological Societies, as well as a member of several other scientific associations, and until within two years of his death was constant in his attendance at their meetings.

THE University of Pennsylvania Press has published a 'Syllabus of Lectures on the Vertebrata,' by the late Professor E. D. Cope. It is stated in the preface that the book is a corrected and extended edition of 'The Syllabus of Lectures on Geology and Paleontology,' Part III.: 'Paleontology of the Vertebra,' published in 1891, and was originally designed for use in the extension lectures of the University. The book includes an introduction of thirty-five pages on the 'Life and Works of Cope,' by Professor Osborn, and a portrait of Cope as frontispiece. A limited number of copies of this work is offered for sale, in cloth for \$1.25, or with a paper cover for \$1.00.

THE first of the four volumes of Huxley's Scientific Memoirs has been issued. The work, which Professor Michael Foster and Professor Ray Lankester are editing, is being published by The Macmillan Company as a contribution to the Huxley memorial. A portrait of Huxley, taken in 1857, serves as a frontispiece of the volume, which contains 600 pages.

MESSRS. G. P. PUTNAM'S SONS have just issued, as the first volume of their 'Science Series,' 'The Study of Man,' by Professor A. C. Haddon. They have arranged for the following volumes of the series in addition to those already announced: 'Rivers of North America,' by Professor Israel C. Russell; 'Whales,' by F. E. Beddard; 'Bacteria,' by Dr. J. H. Gladstone; 'History of Botany,' by Professor A. H. Green; 'Planetary Motion,' by Dr. G. W. Hill, and 'Infection and Immunity,' by Dr. George M. Sternberg. The title of Professor Young's book has been changed to 'Meteors and Comets,' and that of Professor Brinton's to 'Ethnic Psychology.'

M. MOURLON, of the Belgian Geological Survey, writes that the favorable reception met with by Volume I. of the series B of the *Bibliographia geologica*, cataloguing the publications since the 1st of January, 1896, and Volume II., soon to be ready, leads the Survey to publish Volume I. of the series A, or retrospective series, giving the titles of geological publications published prior to 1896. The first volume of this series will comprise the titles of all geological publications of the library of the Geological Survey,

and will consequently constitute the first part of the catalogue of this library (drawn up according to the decimal classification). Authors are requested to send copies of their publications in order that they may be included in the Bibliography.

UNIVERSITY AND EDUCATIONAL NEWS.

THE late A. S. Van Wickle, of Hazleton, Pa., has bequeathed \$45,000 each to Princeton University and to Brown University and \$30,000 to Lafayette College.

CHANCELLOR MACCRACKEN, of New York University, has announced an anonymous donation, thought to be from Miss Helen Gould, of \$50,000 to New York University.

MT. HOLYOKE COLLEGE receives \$5,000 by the will of the late Elijah A. Morse, and Tufts College \$2,000 by the will of the late Mrs. Eugenia Stowe, of Meriden, Conn.

THE Board of Trustees of the University of Rochester has adopted resolutions admitting women to the institution when \$100,000 shall have been raised for the purpose.

AT the recent commencement exercises of the University of Nebraska 88 students were admitted to the degree of Bachelor of Arts, 44 to the degree of Bachelor of Science, 39 to the degree of Bachelor of Laws, 40 to the degree of Master of Arts, and 2 to the degree of Doctor of Philosophy. The University long since abandoned the practice of conferring advanced degrees upon any other basis than that of resident work under the direction of the faculty.

IT is reported that President Andrews, of Brown University, has been offered and will accept the superintendency of the public schools of Chicago.

THE following promotions have been made at Johns Hopkins University: Dr. Joseph S. Ames to a full professorship of physics; Dr. J. Elliott Gilpin and Dr. Harry C. Jones to be associates in chemistry and physical chemistry, respectively, and Dr. Luis E. Livingood to be associate in pathology. The Bruce fellowship was awarded to Gilbert A. Drew, of Iowa, who this year receives the degree of Ph.D. in biology.

At a recent meeting of the Regents of the University of Nebraska, Dr. Frederic E. Clements was promoted from the position of assistant to that of instructor in botany. The following were elected fellows for the collegiate year 1898-9: In mathematics, C. C. Engberg and Alta Johnson; in chemistry, Mariel C. Gere, Benton Dales and Howard C. Parmelee; in pedagogy, William R. Hart; in zoology, Albert B. Lewis and Charles C. Morison; in geology, Cassius A. Fisher; in physics, Samuel R. Cook; in electrical engineering, Charles H. True, and in botany, Albert T. Bell and Cora F. Smith.

MISS AGNES MARY CLAYPOLE, instructor in Wellesley College, has been appointed assistant in the department of histology and comparative physiology in Cornell University.

DR. SOPHUS LIE, professor of mathematics in the University of Leipzig, has *angenommen* accepted a call to the University of Christiania.

DR. GISEVINUS has been appointed associate professor of agriculture in the University of Königsberg; and Dr. Richard Wachsmuth, of Göttingen, has been called to a professorship of physics in the University of Rostock.

DISCUSSION AND CORRESPONDENCE.

'A PRECISE CRITERION OF SPECIES.'

THE papers by Professor C. B. Davenport and J. W. Blankinship, suggesting the determination of species by means of statistical methods, are welcome signs that the appreciation of the value of these methods is rapidly increasing among biologists. Heretofore they have been applied most extensively by anthropologists; consequently the inherent difficulties have become familiar to them, and their experiences will be useful to biologists who pursue these methods.

Statistical data are generally represented in the form of curves; and experience show that most curves, if the number of cases is sufficiently large, approximately conform to the probability curve. When the number of cases is small the curves tend to become more and more irregular, and the question arises: How

large must the number of cases be in order to be significant, that is to say, in order to justify us in assuming that the few selected individuals represent a curve which deviates from the probability curve? All the curves given by Professor Davenport and Professor Blankinship in their paper are based on material not sufficiently extensive to compel us to assume that the distribution differs from the law of probability. For example, the data contained in Fig. 9, which is one of the best of Professor Davenport's examples, are not of such a character that we must necessarily assume a curve deviating from the normal probability curve. If a thousand individuals had been measured instead of forty-six only, irregularities of the curve would probably disappear. The same is true of Professor Blankinship's measurements. The secondary maximum in his best table (No. VI., Fig. 17) is so uncertain that, until further data are forthcoming, we must assume that with an increased number of measurements the secondary maximum will disappear entirely.

Furthermore, it must be considered that under certain conditions the distribution of measurements cannot conform to the probability curve. Such is the case in conditions like those exemplified in Table VII. of Professor Blankinship's paper. Here the greatest relative frequency is that of the value zero. Smaller values are not possible; consequently all the variations must be on the positive side. The same is true wherever the measured value is very near zero. In these cases the distribution must be a symmetrical.

But granted the supposition that curves exist which have more than one maximum, the question arises whether we are justified in assuming that the two maxima represent two species inhabiting the same area. First of all, it must be mentioned that, assuming equal frequency and equal variability of the two species, two maxima will occur only when the distance between the two types is greater than the standard deviation of either type. When the difference is less, the result is apparently an increased variability. When two maxima exist, the biological problem resolves itself into a mathematical analysis of the given curve. Owing to the impossibility of obtaining sufficiently extensive material, and to the consequent inaccuracies of the results of

observations, as well as on account of the complexity of the curve, such an analysis must always be based on certain biological assumptions. Karl Pearson has shown how difficult an analysis of such curves is. If we assume that the composite curve results from measurements of two coexisting species we make one of many possible assumptions. Natural selection and mixture are two causes which may have effects of a similar character. When, for instance, two distinct types interbreed, and the offspring show a tendency to revert to either parental type, curves will result with two maxima, each representing one of the parental types; but this curve does not originate by addition of the two composing curves; it is much rather an unknown function of these curves. A case of this character was described by me when treating of the anthropometric characteristics of the descendants of Indian mothers and white fathers. On the other hand, when natural selection acts in such a way that a certain group of individuals is least favored, and if these individuals are not far removed from the average type, curves with two maxima may develop. It will, therefore, be seen that the mere existence of curves with two maxima does not by any means signify the existence of two distinct species.

The question of correlation, which has been well set forth by Professor Blankinship, seems a most interesting one, and has received very able treatment at the hands of Karl Pearson, who clearly set forth the theory of this subject. It does not seem likely that this method can be utilized for distinguishing between specific and individual characters. In the same species certain organs prove to be strongly correlated, while others are only slightly correlated; and according to this degree of correlation the proportions will change among various types, and it is probable that the degree of correlation will remain the same among all closely related types.

Since the application of statistical methods to zoology is still in its infancy, it is to be hoped that the study may be taken up according to strict methods, in order to avoid erroneous conclusions.

FRANZ BOAS.

SCIENTIFIC LITERATURE.

J. BOLYAI, *Scientia Spatii Absolute Vera*. With a Magyar translation by SUTÁK J., and a biography by FR. SCHMIDT. Budapest, Schmidt Ferencz. 1897. 8vo. Pp. xxviii + 148.

W. BOLYAI DE BOLYA, *Tentamen juventutem studiosam in elementa matheseos puræ elementaris ac sublimioris methodo intuitiva evidentiæ huic propria introducendi, cum appendice triplici*. Budapestini, Sumptibus Academiæ Scientiarum Hungariæ. 1897. Editio Secunda. Tomus I. 4to. Pp. xli + 679. Price, 50 francs.

Sixty-five years after its issue from the little provincial press of the 'Collegii Reformatorum' in Maros Vásárhely, why does the proud Hungarian Academy of Science reissue, in sumptuous quarto form, a magnificent *édition de luxe*, this strange Tentamen?

Bolyai Farkas (Wolfgang Bolyai) has two unimpeachable certificates of immortality. He was the father of Bolyai János, and he first publicly appreciated Lobachévski. The second of these two titles, though destined to bulk large in the final history of human thought, has never before been explicitly mentioned by any one, so far as I know. I here call attention to it for the first time. If any praise or appreciation of Lobachévski was ever published or printed before 1851, I have never heard of it. In Russia he found only such rude and offensive ironies as fill a criticism in one of the St. Petersburg journals, 'Son of the Fatherland,' 1834, or else complete indifference. The academician V. Bunyakovski in his work, 'Parallel Lines,' printed in 1853, does not even mention the investigations of Lobachévski. Among his own pupils not one worked at his ideas or appeared as their convinced defender.

Vasiliev, Engel and Staekel give 1866 as the date of the beginning of the movement to recognize the non-Euclidean geometry. Vasiliev attributes the start to the Frenchman Hoüel, 'whom we must remember to-day with gratitude.' Engel in a note to this sentence of Vasiliev's Address traces back the initiative to Baltzer: "Hier haette Baltzer erwaeht werden sollen, durch den Hoüel erst auf Lobatschefskij und Bolyai aufmerksam gemacht worden war." This was stated by Hoüel himself

in 1867: "C'est aux indications du Dr. Baltzer que je dois la connaissance de ces importants travaux."

Thus interested, Hoüel besought aid of an architect of Temesvár who had written to enquire of him about French mathematical books. The coincidence was most fortunate, for this architect was Fr. Schmidt, whose father, Anton Schmidt, had often told him of a young officer of engineers with whom he always feared to come in contact, who, to prove the might of his arm and the temper of his Damascus blade, was accustomed to show his visitors how with one stroke he could cut off a heavy nail driven into his door-post. This was Bolyai János. The facts collected by Fr. Schmidt in 1867, published in Grunert's *Archiv* and by Hoüel in 1868, were all the world knew of the two Bolyai for nearly thirty years.

Moreover, the first biographer became a sort of local representative for the world of science in all matters pertaining to Bolyai János. He procured for Hoüel two copies of the exceedingly rare 'Science Absolute,' from one of which Hoüel made his French translation, sending the other to Battaglini, who translated it into Italian, both translations appearing in 1868. In 1872 Schmidt furnished Frischauf the original for his German version. Now in 1897 he publishes at his own expense the Latin, with the first rendering in the native tongue of the author, the Magyar, and a new biography of János, but far too short, nine pages.

The Hungarian Academy of Science, in their costly edition of the father's *Tentamen*, have so rearranged the material that the immortal Appendix of the son is displaced from the first volume, the only one yet issued. Both the above books are, therefore, needed by one who would contrast the concise elegance of the son, who solved the problem of the ages, with the florid freedom of the father, who had failed.

The 'Science Absolute' has appeared in six languages and a Japanese reprint of the English.

The *Tentamen* will probably never be translated. Suták points out how it anticipates Riemann and Helmholtz.

(1) Space is continuous (V. I., p. 442).

(2) Rigid bodies exist independent of place, freely movable (principle of congruence, p. 444).

(3) Rigid bodies can move with one or two points fixed, not in general three (p. 446).

(4) Monodromie (p. 447) (motion which continued brings a point again into its first place).

From Lie's reinvestigation results that this fourth principle is a consequence of the others, though here Suták has the hardihood to attack Lie.

This anticipation is carried out consequently, and would have been complete, except that W. Bolyai postulates the infinity of space.

Now follows the first appreciation ever printed of the non-Euclidean geometry. W. Bolyai has the double honor, first to have praised in print each of the two founders of this marvellous doctrine. He was the first convert who dared profess his regeneration openly. The world waited thirty-five years for a second.

One sentence from the *Tentamen* must serve as specimen of his praise and penetration: "The Author of the Appendix, attacking the matter with singular acumen, comprehending in general (if except the remaining axioms none be assumed) all systems subjectively possible for us (that is, of which one only exists, though which is really true we cannot decide) makes a geometry absolutely true for every case; though in the Appendix of this volume he has given from a great mass only the strictly necessary, much (as the general solution of the tetrahedron, and many other elegant disquisitions) for the sake of brevity being omitted." His praise and discriminating exposition of Lobachévski was printed twenty years later.

In his 'Kurzer Grundriss eines Versuchs' (1851), § 32, speaking of 'the admirable work' of Lobachévski (1840), he says: "This alone is a proof of an extraordinary genius. Probably in the 'gelehrten Schriften' of Kazan University still more is communicated of that wherewith he has made debtor the centuries.

"Here also in the year 1832 appeared at the end of the first (Latin) volume an appendix so very like to that, that to both (since neither had seen the other) must have appeared the same Original of truth after thousands of years."

Then follows a comparison of Lobachévski with Bolyai János, and an elegant characterization of the non-Euclidean geometry.

Fresh after half a century, should not this

strange monument in the history of science find also somewhere speedy reissue?

GEORGE BRUCE HALSTED.

AUSTIN, TEXAS.

The Psychology of Suggestion. By BORIS SIDIS, M.A., Ph.D., Associate in Psychology at the Pathological Institute of the New York State Hospitals. With an Introduction by PROFESSOR WILLIAM JAMES, of Harvard University. New York, D. Appleton & Co. 1898.

Dr. Sidis divides his book into three parts, entitled, respectively, 'Suggestibility,' 'The Self,' and 'Society.' The interest of the first centers in two series of laboratory experiments and is intended to establish the 'Laws of Normal and Abnormal Suggestibility.' The second aims at establishing in every human being the existence of a 'Subwaking Self,' determining its intrinsic character, its relation to the primary self, its physiological conditions, and its relation to the phenomena of amnesia and insanity. The third ascribes to the activity of the subwaking self, stampedes, social epidemics, and in general the peculiar traits of crowd and mob psychology.

Suggestion is defined as 'the intrusion into the mind of an idea; met with more or less opposition by the person; accepted uncritically at last; and realized unreflectively, almost automatically.'

This definition has obviously been framed with the thought of normal suggestibility in mind, for in states of heightened, or, as Dr. Sidis would term it, abnormal suggestibility, the idea frequently meets with no opposition whatever. Nothing is more common than to see such patients anxiously consider and deliberately realize the suggestions given them. To make it apply throughout, the suggestion should be described as an idea which *would be* met with more or less opposition in the normal state, but which in the normal state is accepted, *usually* uncritically, and realized, *often* unreflectively, while in the abnormal state it meets with little or no opposition.

Yet even as thus amended, the definition would require us to show, before any intruded and realized idea can be termed a suggestion, that it would have met with opposition, of which

we have usually no better criterion than such as our knowledge of the tastes and habits of the individual in question can supply.

In Dr. Sidis' series of experiments he endeavored, by very ingenious means, to determine the subject's flow of ideas or to affect his choice of a limited number of alternatives without attracting his attention to the method by which he was influenced. The results are interesting, although one would like to have more precise information as to the conditions under which they were obtained. The main conclusion which Dr. Sidis deduces from these experiments he generalizes into the 'Law of Normal Suggestibility'—'Normal Suggestibility varies as indirect suggestion and inversely as direct suggestion.' Then after a review of the phenomena of hypnosis, he sets over against this 'The Law of Abnormal Suggestibility,' which 'varies as direct suggestion and inversely as indirect suggestion.'

Unfortunately, the distinction between direct and indirect suggestion has nowhere been defined. From the illustrations given, however, we may infer that a suggestion is indirect when it is so administered that it never passes beyond the marginal region. It then remains a mere seed upon the surface of consciousness, never strikes its roots down into the depths below, is merely *apprehended* and not *comprehended*. A normally repugnant intruded idea will then be less likely to arouse opposition and more likely to gain its ends if indirect than if direct, and the first law may be accepted as so far true even without experimental verification. But it should be noted that the numerous cases in which the opposition of the self-consciousness to a direct suggestion is overborne by sheer superior strength of will must be relegated to the class of abnormal suggestions—a more than questionable proceeding.

The second law, however, is by no means true. Increased susceptibility to direct suggestion does not carry with it diminished susceptibility to indirect suggestion. In states of heightened suggestibility, susceptibility to suggestion has no significant relation to the mode in which the suggestion is administered, but rather to the *source whence it comes*. A subject who is acutely sensitive to every suggestion, direct or indirect, that emanates from the person

who has hypnotized him, will be, as a rule, absolutely obtuse to the most direct of suggestions given by any other person. *Rapport*, although not an inevitable, is perhaps one of the most constant traits of heightened suggestibility, and this Dr. Sidis' second law ignores. Furthermore, it puts in an inverse relation traits that usually vary directly.

In his theory of the 'subwaking self,' Dr. Sidis takes ground between Myers and Pierre Janet. With Myers he holds that the subwaking self is a normal constituent of every human being and is not merely a 'disaggregation phenomenon.' With Pierre Janet he denies to it personality and self-consciousness, save in rare cases, and describes it as a congeries of ill coordinated, extremely suggestible, dream-like states. He further concludes that it is possessed of acute senses, but lacks sense and all power of criticism, is servile, cowardly, devoid of morality and of the power of willing. The relation between the primary and secondary selves is not clearly defined. Intercommunication exists, however, to some extent, and the phenomena of hypnosis, suggestibility, automatism, amnesia, insanity and of crowd and mob psychology are ascribed to a dissociation between the two selves whereby the inhibition of the primary is removed and the peculiar traits of the secondary are allowed to come to light.

To frame his physiological theory, Dr. Sidis simply substitutes for his 'moments content,' or psychic element, the nerve-cell, for association, contact of terminal filaments, for dissociation retraction of the terminal filaments and consequent loss of contact. Quite apart from the doubt cast upon 'no-anastomosis-but-approximation-only' theory by the recent publication of Apáthy's work, there never has been any physiological evidence for the theory which Dr. Sidis adopts. It rests solely upon anatomical observations and should not be put forward without due recognition of its speculative character.

But if Dr. Sidis' passion for logical clearness and exact formulation has betrayed him into making generalizations upon insufficient data, it has none the less made his book the more interesting. Even where the daring of his state-

ments challenges dissent, one cannot but feel sympathy for these bold attempts to introduce order into chaos, and for the scientific enthusiasm which inspired them. Attention should also be called to the interesting case of amnesia of which a brief account is given in Chapter XXII. and to the even more interesting series of experiments upon subconscious perception.

WM. ROMAIN NEWBOLD,

UNIVERSITY OF PENNSYLVANIA.

Erkenntnistheoretische Grundzüge der Naturwissenschaften und ihre Beziehungen zum Geistesleben der Gegenwart. P. VOLKMANN. Leipzig, Teubner. Pp. xii+181.

Étude critique du matérialisme et du spiritualisme par la physique expérimentale. RAOUL PICTET. Geneva, Georg & Co. Pp. xix + 596.

Readers of SCIENCE who see also the columns of *Nature* may remember that the former of the above-named books was made not long ago the occasion of a rather sharp polemic by Dr. Karl Pearson on 'the departing glory of German science.' Now it may well be that Dr. Pearson's extended reading justifies his contention of the decadence of science in Germany, but certainly his illustrative examples were hardly well chosen. The *Grundzüge* is not a great book. It may even be one of a class of books not worth writing—an attempt to explain and to justify to a popular audience the scientific movement of the time. The critic justly charges the book with vagueness; with incompleteness; with failure in a labored effort to distinguish between certain scientific terms, as law, rule, principle, hypothesis; and especially with pushing too far loose analogies drawn from natural science and applied to other fields of thought.

But he is particularly severe upon Professor Volkmann for not seeming to have clear vision of the truth that all so-called natural laws are simply laws of the mind. Now the fact is that the book before us is as emphatic as Dr. Pearson himself could be in declaring that scientific laws are always and everywhere, like those of mathematics, constructions of the mind; only the author adds, these constructions must conform to experience. See p. 57, etc.

But the criticism is mainly unsatisfactory in

that it does not contain a single allusion to the main purpose or the principal thesis of the book reviewed.

The purpose of the book is to teach liberality of mind. The author summons us to look at every question from many points of view, to learn a wise reserve of judgment and opinion and to grant that there may be much in a subject which we do not know and which may yet be important.

The thesis of the book is that the natural sciences are especially adapted to secure this type of mind. The sciences of nature are not opposed to the sciences of the soul, but should form a whole with them and, through education, penetrate more deeply into the spiritual life of the present time. They are the productive, as the historico-psychological sciences are the reproductive, sciences and form the real motive power of our civilization.

In particular they are adapted to this end by at once stimulating and giving balance to what he terms the *isolating* and the *superposing* habit of mind. What does he mean?

How shall the mind deal with its cerebral baggage, its chaos of sense impressions and experiences? It may consider these mental presentations from a single point of view, rationalize them and build them into a complete and final system, or it may, *in accordance with the interest of the hour*, combine and recombine them and ever hold these constructions open for new material and fresh types.

So the contrasted terms '*Isolation*' and '*Superposition*,' familiar in the principle of the parallelogram of forces, vector analysis and the like, already extended in their application by Boltzmann and others (Wiedemann's *Annalen*, 57, p. 45, 1896), are here made to occupy a central place in the theory of knowledge (pp. 123, 130, etc.).

In education the '*isolating*' habit should predominate. Here the great purpose is to form the will, and for this purpose nothing is so well adapted as prolonged attention to some congenial subject from a single point of view. The aim is, through concentration of attention and effort, to secure unity of effect. And this habit of mind will always be useful, especially in art, religion and manners.

But with this ideal of a closed culture, a complete system, a final view of the world and of life, young people would go out into the world children, intolerant, quick in contradiction, unable to see a subject from more than one point of view, judging everything by their narrow system or their personal experience (p. 145).

But education, and particularly scientific education, has another side. It is continually bringing new fields of experience to bear upon and modify the old. Especially in advanced education the man learns to value that which is *essential to the purpose in hand* and to care less about the universal, the complete and the systematic. Every man is continually coming into a new world of interests and activities, and a part of the '*fitness*' which secures '*survival*' and prosperity is the ability to adjust himself to these changes. A large part of the book, which as a whole consists of detached popular papers and lectures, is made up of examples of these two habits of mind in science and in life.

As would easily be inferred, the author warns us against making too much of the atomistic philosophy. Monism he discredits as being a closed system, a final view. Materialism finds no favor in his eyes for the same reason. '*Science is neither materialistic nor idealistic.*'

The second book named above is at once the more interesting and the more important, but a synopsis of it is impossible, as it is itself a synopsis of the whole field of science in the interest of a spiritualistic philosophy. The author, Raoul Pictet, is well known by his early work in the liquefaction of gases. He, too, aims to be useful, especially to educated young men, whom he finds everywhere burdened with doubt, embarrassed by a philosophy of negation, believing nothing, hoping nothing, ready to abdicate personality.

The source of the malady he finds in a prevalent materialism which these young men suppose that science has somehow established. So he writes some 600 vigorous, entertaining pages to show that the materialistic position has not been proved; that, in fact, science disowns it.

The questions: Is man a machine? Is he free? bring us to the physical question: Can all

motion, all change, all intelligence, all feeling, be explained by the impact of matter upon matter or of matter upon ether? This question he pursues relentlessly into the remotest corners of the sciences of nature and man, answering it everywhere with an emphatic No.

But the argument is not wholly negative. The author would prove on the basis of experimental science that there is something in our universe beside matter in motion as the result of impact. Science deals with the question, How; Why and What are matters of taste and intellectual insight? Asking how matter moves, science arrives at the doctrine of the *potential*, gravitational, electric, magnetic, functional, intellectual, etc. The doctrine of the potential is utterly irreconcilable with the materialistic position (pp. 175 to 396).

Of course, much of this matter must be commonplace, as in any systematic exposition, but the recent and the recondite are not neglected, and the author's own researches are freely alluded to and given more fully in the appendices.

The book has a charming vivacity and is full of examples of felicity of statement and diction. It is also rich in anecdote and illustration. Many who would care nothing for the argument of the book would find pleasure in the account of Ampère's experiment (p. 100), of the synthetic free man (p. 355), of the materialistic explanation of whim and fashion (p. 361), of the encounter with a mob (p. 400), and the assassination of Paul I. of Russia (p. 416).

E. A. STRONG.

The Meaning of Education. By DR. NICHOLAS MURRAY BUTLER. The Macmillan Company. Pp. 230. Price, \$1.

This book is not a systematic work upon only a single subject; its seven chapters, instead, are mainly addresses that have been delivered in different parts of the country on various themes.

But the subjects chosen are leading questions in modern education; one is the American College and University, two pertain to the secondary school, and the four others involve particularly the aim of education, the characteristics of the new education, the relative values of studies and the relation of evolution to education. The selection of these topics indicates

the author's interest in all phases of education, and their treatment reveals his deep sympathy with modern views.

The book is likely to find an especially large number of readers, because it will appeal both to the educational expert and to teachers and citizens in general.

Its value to the specialist in pedagogy is due partly to the real newness of some of its thoughts, partly to their breadth of treatment.

For example, few teachers of method have seriously considered the relation of evolution to educational theory; to many, therefore, the first chapter, entitled the 'Meaning of Education,' will open up a new field of thought. Most of these specialists, also, devote their attention mainly to a very few phases of education; such as these Dr. Butler's wide interest and knowledge cannot help but broaden. There is hardly another man in the United States who has had an equal opportunity with him to acquaint himself with the condition of education in this country and abroad. Consequently his statements can rightly be regarded as authoritative. This fact lends great interest to the book, for Dr. Butler is not a man who fails to make concise statements that reveal the exact condition of affairs. For example, on p. 77 he declares, in substance, that most college professors know no more about the science of education than the motorman on a trolley car about the science of electricity—a statement that is certainly interesting and no doubt true.

Partly on account of the above facts, the book will prove of great value to teachers and citizens in general. Dr. Butler is peculiarly a man of the world; he is as well acquainted with the business man as with the teacher, and can make himself as fully understood and appreciated by the former as by the latter. Both will find in this book an outline, in brief, of the new education, but so simply and beautifully presented that, instead of taking offense at it because of its being the 'new education,' they are likely to regard it as entirely sensible. The book will, therefore, do much to establish sympathy among intelligent men and women for modern views on education.

FRANK McMURRY.

UNIVERSITY OF BUFFALO.

SOCIETIES AND ACADEMIES.

MEETING OF THE NEW YORK SECTION OF THE AMERICAN CHEMICAL SOCIETY.

THE New York Section of the American Chemical Society held its meeting on the third instant at the College of the City of New York, forty-four members present, and Dr. Wm. McMurtrie presiding.

The following papers were read:

- (1) F. J. Pope, 'A Preliminary Note on the Titaniferous Magnetites of Eastern Ontario.'
- (2) E. J. Levine, 'A Comparison of Some Methods used for the determination of Starch.'
- (3) C. H. Fulton, 'The Assay of Teluride Ores.'
- (4) W. S. Meyers, 'Note on a Convenient Method for Maintaining Reduction of Ferrous Solutions.'
- (5) C. F. McKenna, 'Slag Cements.'
- (6) G. L. Heath, 'A Short Study of Methods for the Estimation of Sulphur in Coal.' Read by title.

Dr. McKenna's paper gave a very interesting résumé of the status of slag cements and was discussed by Messrs. Richardson and McMurtrie.

A report by the Secretary showed that nine regular and two special meetings had been held, at which thirty-five papers had been read, with an average attendance of about fifty. The membership of the section is 276.

The election of officers for the ensuing year took place in accordance with the recent action of the Section in ordering the election for the June meeting instead of October, as formerly, thus enabling the summer months to be more profitably used in accumulating material for the next season's meetings.

Dr. McMurtrie was unanimously re-elected Chairman, after a neat little speech by Professor Bogert, in which the appreciation of the Section was well expressed for the efficient conduct of the meetings during the season. Dr. McMurtrie replied that it was his desire that some one else should succeed him, but that if it were the wish of the section to have him continue in office another year he would not decline, but would continue in the effort to make the New York Section the largest and most active of any of the sections; in which effort, however, he needed and desired the hearty coöperation and assist-

ance of every member, present and absent. On motion the nominations were closed and a unanimous rising vote taken.

Durand Woodman was re-elected Secretary and Treasurer, no other nomination being made, as also the Executive Committee—C. A. Doremus, A. C. Hale and A. A. Breneman. Delegates to the Scientific Alliance—E. E. Smith and Marston T. Bogert.

The next meeting will be held early in October.

DURAND WOODMAN.

Secretary.

TORREY BOTANICAL CLUB, APRIL 12, 1898.

THE scientific program was as follows:

1. Dr. Underwood presented a paper by Rev. E. J. Hill, of Chicago, on '*Vitis Labrusca* and its Westward Distribution,' describing its growth on the sand-hills south of Lake Michigan, there showing, among its specific characters, a tough skin and pulp, large seeds, blue to vinous-purple color, and globose or depressed fruit even larger than in cultivated varieties, such as the Concord.

Discussion followed, Dr. Britton speaking of the high value to be attached to the character founded on intermittent tendrils. The Secretary and Dr. Rusby spoke of pink, purple and other colors among its variants in nature. Mr. Rydberg mentioned the similar wide range of color-variants in *Prunus* in Nebraska, where leaf and other characters may be indistinguishable, but the fruit will vary in color, and also in flesh, taste and flavor.

2. A communication on 'South American Piperaceæ' was presented by Dr. Rusby, on behalf of Professor Casimir de Candolle. Professor de Candolle, in studying the last of the collections in this family made by Mr. Bang, had also determined a considerable number of Bolivian specimens pertaining to the early collections of Weddell, Mandon and others. Among the results were the eleven new species now described. These new species were exhibited, and remarks were also made by Dr. Rusby, descriptive of the habits and appearances of these plants as they grow in the Andes.

Dr. Britton spoke of the interest attaching to the Piperaceæ as the simplest type of the Dicotyledons, because of the simple character of the

carpels, fruit and tissues. Dr. Rusby referred to the separation of *Saururus* from the Piperaceæ, and to Dr. Henry's investigations now in progress upon a *Saururus* in China.

3. The next feature of the evening was the exhibition, by Dr. Britton, of a large and interesting set of blue prints from tracings made from Mexican plants. The originals were sent by Mocino and Sesse to M. Alphonse de Candolle at Geneva, but these and the accompanying text remained unpublished. Recently the text has been issued by the Mexican Natural History Society. The elder de Candolle furnished a series of tracings to Dr. Gray, from which the blue prints exhibited have been made at the instance of Dr. J. N. Rose, of Washington, D. C. An index and preface to the blue-prints has been supplied by M. Casimir de Candolle.

4. The subject next following was that of those members of the Convolvulaceæ which form large fleshy roots, introduced by Dr. Rusby, who exhibited specimens of the roots of *Ipomœa pandurata* sent by Mr. C. R. Beadle, of Biltmore, N. C. Three fusiform roots reached from 3 to 4½ feet long, 3 to 5 inches thick, and also developed at least one foot of slender root above, below the surface of the ground. One of these was forked, suggesting its name of 'Man in-the-Ground.' Medicinally it is used as a purgative.

Dr. Rydberg referred to the thicker, shorter root of *Ipomœa leptophylla*, which has a sweet taste, and frequents hillsides, where its roots serve as a storehouse for moisture as well as for starch.

Dr. Rusby suggested that the resinous matter found in these roots may be primarily a waste product, but is perhaps useful to the plant as a means of preventing its being eaten by enemies.

5. The next communication was from Mrs. E. G. Britton, on 'A Hybrid Moss.' Mrs. Britton exhibited Contribution No. 72 from the Herbarium of Columbia reprinted from the *Bulletin* for February, 1895, showing plate 231 to illustrate a hybrid of *Aphanorhegma serratum* collected by Drummond near St. Louis, Missouri, in 1841, and stated that the same hybrid had been rediscovered by Mr. D. A. Burnett on December 12, 1896, near Bradford, Pennsyl-

vania, along the Erie Railroad, on a heap of ashes left by burning old ties, and that it was associated with *Bryum argenteum* and *Funaria hygrometrica*. As in the case of Drummond's specimens, the antheridial parent is unknown, but was probably *Physcomitrium turbinatum*; it scarcely seems possible that it could have been *Funaria*. The specimens agree in every way and show various degrees of heredity from each parent. On most of the plants typical immersed capsules of *Aphanorhegma* occur together with either one exserted, long-pedicelled capsule of *Physcomitrium* or with two smaller immersed capsules more closely related to *Physcomitrium* than to *Aphanorhegma*. As in Drummond's specimens, the apical lid with a clearly differentiated border, the shallow spore-sac, and especially the different cell-structure of the walls and the less developed spores, clearly distinguish the hybrid sporophytes from typical *Aphanorhegma*.

Discussion followed regarding hybrid ferns and respecting *Asplenium ebenum* and *A. ebenoides*. In answer to questions by Dr. Rusby, Dr. Underwood said that where both species grow together in North Carolina he finds *A. ebenoides* growing beneath cliffs, but *A. ebenum* in different situations about the edges of bowlders, while the associated fern *Campnosorus* inhabits only the flat tops of the rocks.

EDWARD S. BURGESS,
Secretary.

NEW BOOKS.

The Study of Man. ALFRED C. HADDON. New York, G. P. Putnam's Sons; London, Bliss, Sands & Co. 1898. Pp. xxv + 410. \$2.00.

Syllabus on Vertebrata. EDWARD D. COPE. With an introduction by HENRY F. OSBORN. Philadelphia, Published for the University of Pennsylvania. 1898. Pp. xxxv + 135.

Hand-Book of Nature Study. D. LANGE. New York and London, The Macmillan Company. 1898. Pp. xv + 329. \$1.00.

Nature Study in Elementary Schools. Reader: Myths, Stories, Poems. MRS. LUCY LANGDON WILLIAMS WILSON. New York and London, The Macmillan Company. 1898. Pp. 181. 35 cents.

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